**Non-Accidental Trauma (NAT) Protocol**

All children suspected of non-accidental trauma will have a complete work-up including a complete history and physical exam with a focus on injuries and explanation for the injuries.

**Major Areas of Evaluation:**

1. A complete history (document from/by whom & if it contradicts prior story)
   a. Including review of prior PCP, ED, and inpatient records as well as prior radiologic studies performed at outside hospitals (if available) to look for sentinel injuries

2. Head to toe physical exam with particular attention to:
   a. Growth parameters
   b. Thorough skin exam, including scalp and hair (undress patient completely)
   c. Palpation of legs, arms, hands, feet and ribs to feel for crepitus or deformities
   d. Complete neurologic examination
   e. Oral examination with attention to the lips, tongue, buccal mucosa, frenula, palate and teeth
   f. Auricle exam
   g. Genitalia examination

3. Head Imaging
   a. Infants < 12 months of age should have a CT scan without contrast or MRI of the brain (preferred if patient has no sign of injury and normal mental status) to evaluate for intracranial injuries. This should be performed regardless of the presence or absence of neurologic findings.

   b. Children > 12 months of age should have a CT scan without contrast if there is mental status depression or any other signs of neurological injury. This may also include external signs of head injury, such as facial bruising or scalp hematoma.

   c. If the CT scan without contrast or MRI indicates signs of trauma, MRI of the c-spine should be considered.
d. If there is a suspicion of a skull fracture, consider ordering a CT scan with 3D reconstruction, to better clarify fracture versus suture (must be ordered prior to the CT scan being done).

e. If there is clinical concern or disagreement with the outside study, order a formal second opinion read. Having the outside report is helpful but not necessary.

4. Abdominal Imaging

a. Any child who presents with signs/symptoms of abdominal trauma, bruising to the abdomen or torso, or an ALT/AST that is higher than twice normal should have a CT of the abdomen/pelvis with IV contrast.

b. Consider abdominal CT if urinalysis has >10 RBCs and/or positive stool guaiac.

5. Skeletal Survey (should be obtained Monday through Friday during normal business hours UNLESS this would delay discharge)

a. Children < 3 years of age should have a skeletal survey to evaluate for occult fractures. When ordering a skeletal survey, be sure to include oblique x-rays of the ribs.

b. Children > 3 years of age can have x-rays focusing on areas of concern rather than the entire skeleton.

c. Consider getting a full skeletal survey in children > 3 years of age with developmental delays.

d. For skeletal surveys performed at outside hospitals, consider reviewing it with a Pediatric Radiologist to determine the completeness and quality of the study and the potential need for additional films.

e. Follow up skeletal survey should be obtained at Upstate two weeks following the suspected trauma to check for fractures that are too acute to show up on initial survey (i.e. rib fractures).

6. Ophthalmology Evaluation

a. Children < 12 months of age should have an ophthalmologic evaluation to look for retinal hemorrhages. Retinal photographs should be obtained, when possible.

b. Children > 12 months of age should have an ophthalmologic evaluation when eye injuries are suspected, when head injury is suspected, and/or when there is facial bruising.
c. Ophthalmologic examination should be obtained as soon as possible. However, the dilated eye exam should be deferred in children with head injuries pending neurosurgery clearance.

7. Lab Evaluation

a. The following labs should be ordered routinely on all children suspected of NAT:

- CBC with diff and platelets
- Amylase
- Lipase
- CMP
- PT/PTT/INR
- Urinalysis with microscopic
- Stool for occult blood

b. Consider a UDS/toxicology evaluation if there is clinical suspicion of exposure to substances or in children < 2 years of age with altered mental status.

c. Consider Vitamin D 25 Hydroxy, Calcium, Phosphorus and PTH if clinically indicated.

8. Medical Photography

a. Order Medical Photography as soon as possible to document any skin findings at the time of presentation, since they can change rapidly. Medical Photography is available Monday through Friday 9-5.

b. When there are skin findings and Medical Photography is not available, the social workers have access to a camera that can document injuries.

c. When Medical Photography is unavailable the MD/NP/PA will photograph the patient with the camera provided by social work. See policy C-06

d. A healthcare provider must be present while the photographs are taken in order to direct the photographer’s attention to areas of concern.

9. Severe Abuse

a. Victims of severe abuse should have a toxicology evaluation.

b. Victims of severe abuse should have a SANE evaluation if clinical concerns regarding sexual abuse or other need for forensic evidence collection.
10. Siblings

a. All siblings or other at risk children in the home of patients that are victims of suspected NAT should be evaluated by their PCP within 24 hours.

b. Upon identification of other possible at risk individuals in the home of a NAT patient, the service managing the patient at the time of discovery should consult Social Work and request Child Protective Services be made aware of those individuals and document accordingly in the progress notes.

11. Admission

a. Admit all patients that have a clinical indication. Patients with identified traumatic injuries or who are undergoing an NAT work up will be admitted to an appropriate surgical service. If Pediatric Surgery is not the primary team, they should be consulted to ensure the NAT work-up is completed and appropriate follow-up is in place.

b. Patients undergoing an NAT work-up meet criteria for inpatient status.

c. Admit patients when there is a concern about the safety of the patient, especially if there is a disagreement between the provider and CPS.

d. Children < 24 months with suspected or documented head injury should have serial head circumferences measured daily.

12. Discharge

a. All children evaluated in the ED where there is concern for possible NAT but who do not meet criteria for inpatient admission should receive a social work consult and CARE clinic should be notified for determination of need for outpatient follow-up.

b. All children admitted for NAT work-up should have a follow-up appointment with the Pediatric Trauma Clinic (315-464-2878) or be connected with the CARE Program at the McMahon-Ryan Child Advocacy Center (315) 883-5617.

c. All children who get a skeletal survey as part of their work-up should have a follow up skeletal survey ordered in EPIC prior to discharge. This should be ordered as an orders only encounter. This should be obtained at Upstate two weeks following the suspected trauma.

d. For patients with head injuries:
• Consider referral for Early Intervention and a hearing evaluation
• Document head circumference on discharge summary

e. If feasible, all follow-up appointments with Pediatric Surgery, CARE, Ophthalmology, Orthopedics, Neurosurgery and/or ENT should be scheduled prior to discharge.

13. Impact Statements

a. An impact statement is a letter written by a health care provider that informs, interprets and provides a medical opinion for child protective workers or the court regarding the level of concern for non-accidental trauma and the impact on the child.

b. Impact Statements should:

• Describe the situation and your relationship to the patient.
• Use layman’s terms to describe medical issues.
• Clearly define your concerns in terms that are meaningful to the court and child protective services.
• Answer questions that CPS has asked.
• Identify your opinion if you have one, but refrain from outright advocacy if possible.
• Usually outline next steps for medical and/or legal needs.

c. The primary team responsible for the patient should generate the impact statement. See Addendum A for Rating Scale for Abuse Likelihood. For documentation tips and sample impact statements, go to the CHAMP website at: http://www.champprogram.com/resources.shtml
ADDENDUM A

Rating Scale for Abuse Likelihood

1. Definitely not inflicted injury (significant, independently verifiable mechanism such as MVC, disinterested witness such as police, ambulance, video documentation, mimic – i.e. Mongolian spot)

2. Not concerning for inflicted injury (mechanism explains all injuries, consistent history)

3. Mildly concerning for inflicted injury (somewhat concerning injuries with no offered history - i.e. unexplained humerus fracture in a 10-month-old or otherwise unconcerning injury with past suspicious injury and same caregiver)

4. Intermediately concerning for inflicted injury (insufficient information to offer an opinion, sequence of events clear but uncertain whether they constitute abuse, necessary lab tests/consultations pending, concerning injury in the setting of bone fragility/bleeding diathesis)

5. Very concerning for inflicted injury (given history unlikely to produce documented injuries or concerning injury with no history of trauma – i.e. 4 month old with femur fracture)

6. Representative of substantial evidence of inflicted injury (severe injury with no offered history in a child incapable of inflicting the injury on himself or herself, history inconsistent with identified injuries, serious injury with changing history or history inconsistent between caregivers, inappropriate delay in seeking care, multiple severe injuries of different ages without plausible explanation)

7. Definite inflicted injury (pattern bruises/burns, unexplained posterior rib fractures, characteristic retinal hemorrhages, reliable eye witness, suspicious injury and concurrently abused sibling, obvious injury with significant, unexplained delay in seeking care – i.e. serious burn, unresponsive child, apparent prolonged seizures)
NAT Smart Phrases Available in EPIC

1. **Bruising**
   
   .NORMALBRUISING: Normal toddler bruising occurs in exploratory surfaces and over bony prominences such as the shins, lower arms, under the chin, the forehead, hips, elbows and ankles. Bruising to the upper arms, torso, cheek, ears, neck, genitalia and buttocks are more likely to be the result of abuse. Bruising to the helix (upper part of the ear) is usually caused by pulling or pinching the top of the ear. Any bruising in a non-ambulatory child with a lack of history of trauma and without evidence of a bleeding disorder is concerning for non-accidental trauma.

2. **Head Injuries**
   
   .SHORTFALL: Falls are the most common cause of injury bringing children to the emergency department and requiring hospital admission. Accidental household falls from furniture most commonly result in minor trauma such as concussion or skull fracture. Serious head injuries purported to be accidental, unless related to a motor vehicle accident or a fall from a significant height, are very likely to be the result of abuse, particularly if the injuries are ascribed to falls from short heights that occur at home, unwitnessed by objective observers (i.e. fall from bed, couch or chair).

   .SUBDURALHEMATOMA: A subdural hemorrhage is a collection of blood between the brain and the dura, the brain’s tough outer covering. They are most often caused by moderate to high energy forces to the head and result when bridging veins are stretched and tear during rapid acceleration-deceleration forces. This can occur in a high speed car accident, fall from extreme height or violent shaking. Generally, acute subdural hematomas are less than 72 hours old. The subacute phase begins 3-7 days after initial injury, and chronic subdural hematomas develop over the course of weeks. These time lines offer a general guideline and are not exact. Acute subdural hematomas most often occur shortly after moderate to severe head injury. Symptoms in infants can include loss of consciousness, seizures, lethargy, irritability, poor feeding, vomiting, bulging fontanelle, and pallor. Symptoms usually appear immediately but in some cases, there may be a lucid interval of a few hours after the injury where the child appears relatively well and normal but subsequently deteriorates as the hematoma forms depending on the location, severity and rapidity with which the hematoma develops. Therefore, it is not possible to provide a precise timeline. The finding of subdural hematomas and retinal hemorrhages in infants are significantly more common in non-accidental trauma than in accidental injury. Retinal hemorrhages are found in non-inflicted head trauma less than 3% of the time.

   .BESS: Benign familial hydrocephalus, also described as benign external hydrocephalus, idiopathic external hydrocephalus, benign extraaxial collections of infancy, or benign subdural effusions of infancy has been raised as a possible cause of spontaneous subdural hematoma. Children with this condition have benign enlargement of the subarachnoid spaces (BESS) on radiologic imaging. Although there remains controversy
regarding the possible mechanism, it continues to be proposed in the literature that the presence of BESS is a risk factor for development of SDH from minor unrecognized trauma. There are case reports of patients with BESS who have been incidentally found to have SDH. To my knowledge, none of these children had additional findings of retinal hemorrhages.

3. **Fractures**

**BIRTHRELATEDFRACTURES**: Rib fractures due to birth trauma can occur, typically in large newborns with a difficult vaginal birth. Healing rib fractures in children older than 3 months or acute fractures in infants older than 1 week are likely the result of non-accidental trauma. Clavicular fractures are the most common birth-related skeletal injury, and a healing fracture in the first 7-10 days of life must be regarded as accidental.

**CLAVICLE**: Any acute clavicular fracture identified after 10 days of life without evidence of healing is suggestive of abuse. Accidental fractures in the medial or lateral end of the clavicle are uncommon in children less than 3 years of age. These fractures are likely the result of shaking.

**FEMURFRACTURES**: Spiral femur fractures occur when a rotational force is applied to the leg during twisting or shaking, torsion when the leg is used as a handle for shaking, or from a direct blow. These fractures typically result from high-energy trauma, such as that caused by a fall from a height or a motor vehicle accident. The presence of a spiral femur fracture in the absence of a history of high energy trauma is very concerning for inflicted injury.

**HUMERUSFRACTURES**: Most non-inflicted humeral fractures are supracondylar in location (near the elbow) and are more common in older children. Abuse related fractures can occur when the arm is used as a handle to the assailant as the infant is pulled, swung or shaken.

**METAPHYSEALFRACTURES**: Metaphyseal fractures, otherwise known as corner fractures, bucket handle fractures or classic metaphyseal lesions, require biomechanical forces that are not produced by the usual accidental trauma of infancy. These fractures result from shearing forces due to rapid acceleration and deceleration as seen with shaking or rotational forces generated from violent traction or twisting of the extremity and are highly specific for non-accidental injury.

**RIBFRACTURES**: Rib fractures in infancy are the result of child abuse more than 80% of the time. Most exceptions to this rule result from high energy trauma. Mechanisms can include squeezing, rotation of the ribs posteriorly with squeezing action, crush injury, or direct trauma. The presence of rib fractures in the absence of a history of high energy trauma is highly suggestive of non-accidental trauma.
.SKULLFRACTURE: The presence of a skull fracture indicates direct impact either from a blow to the head or the rapidly moving head brought up against a static object. Most accidental skull fractures are simple, non-displaced linear fractures occurring over the parietal/occipital region resulting from an accidental fall, are not usually associated with significant clinical problems and do not require treatment.

.TODDLERFRACTURE: Non-displaced spiral fractures of the tibia are a relatively common accidental injury seen in children who are able to stand, cruise or walk (typically 9 months old through age 3). This type of fracture is also known as a toddler fracture or a "Childhood Accidental Spiral Tibial (CAST) fracture. This occurs during routine play activities and may result from running and slipping, jumping and falling, and even sliding with a difficult landing. There may be a delay in seeking medical care because the injury does not initially appear significant. Fractures of this type typically involve the distal half to distal third of the tibia. Fractures of the more proximal tibia may be suspicious for non-accidental trauma.

Fracture Types
.OBLIQUE: Oblique fractures are similar to spiral fractures. They typically result from a bending force with superimposed axial compression, causing the bone to break at an angle. They can result from indirect twisting forces and can be seen in both accidental and non-accidental injury.

.SPIRALFRACTURE: Spiral fractures result from indirect twisting or torsion forces to the bone. They can be associated with abusive injuries primarily in infants and young toddlers. They can also be seen in accidental injury in ambulatory children with a history of a twisting injury. They can also be seen in ambulatory toddlers without a history of trauma (childhood accidental spiral tibia fractures).

.TRANVERSE: Transverse fractures result from a direct force to the bone and can be associated with both accidental and non-accidental injury.

4. Eye Injuries
.RETINALHEME: Retinal hemorrhages (bleeding within the light sensitive tissue that lines the inside of the back of the eye ball) can occur when there is an elevation of intracranial pressure (the pressure inside the skull and brain tissues), intracranial hemorrhage (bleeding that occurs inside the skull), hypoxia (deficiency in the amount of oxygen reaching the tissues), anemia (deficiency of red blood cells or hemoglobin) and increased intrathoracic pressure (increased pressure within the pleural cavity). Significant hemorrhagic retinopathy is most often seen in repetitive acceleration-deceleration forces that accompany high energy trauma such as a car accident or abusive head trauma which cause unique shearing forces inside the eye and orbit that result in significant retinal hemorrhage. The bleeding can be in one eye or both eyes and can be asymmetric. A few retinal hemorrhages confined to the posterior pole may be very non-specific and could result from numerous other causes, but massive retinal
hemorrhage throughout the entire retina is rarely reported in any other condition than abusive head trauma. Excessive coughing and/or vomiting are unlikely to produce significant retinal hemorrhages. The finding of subdural hematomas and retinal hemorrhages in infants are significantly more common in non-accidental trauma than in accidental injury. Retinal hemorrhages are found in non-inflicted head trauma less than 3% of the time.

.RETINOSCHISIS: The presence of retinoschisis (splitting of the retinal layers) is highly specific for abusive head trauma and results from repeated acceleration-deceleration forces (Levin, 2016). In children less than 3 years of age, the vitreous (a clear, jelly-like substance that fills the middle of the eye) is quite firmly adherent to the macula (an oval, yellow-pigmented area on the central retina) and retinal blood vessels, much more so than in the adult. As a result, the repetitive acceleration-deceleration forces applied indirectly to the vitreous exert shearing tractional forces on the retina causing it to split its layers, forming a cystic cavity that fills with blood. A single rapid acceleration-deceleration force such as a fall would not cause retinal hemorrhages or retinoschisis unless the force rose to the level of a fatal impact or crush (i.e. a motor-vehicle crash or fall from greater than 10 meters). There is overwhelming evidence in the literature that supports the conclusion that severe hemorrhagic retinopathy in an otherwise previously well child without obvious history to the contrary (fatal head crush) suggests that the child has been subjected to abusive repetitive acceleration-deceleration trauma.

5. Abuse Likelihood scale

.LIKELIHOODSCALE: After reviewing @FNAME@’s history, exam, and diagnostic studies, it is my opinion that @FNAME@’s injuries/findings are ***.

***Rating Scale for Abuse Likelihood (Pick One)
1. Definitely not inflicted injury (significant, independently verifiable mechanism such as MVC, disinterested witness such as police, ambulance, video documentation, mimic – i.e. Mongolian spot)

2. Not concerning for inflicted injury (mechanism explains all injuries, consistent history)

3. Mildly concerning for inflicted injury (somewhat concerning injuries with no offered history - i.e. unexplained humerus fracture in a 10-month-old or otherwise unconcerning injury with past suspicious injury and same caregiver)

4. Intermediately concerning for inflicted injury (insufficient information to offer an opinion, sequence of events clear but uncertain whether they constitute abuse, necessary lab tests/consultations pending, concerning injury in the setting of bone fragility/bleeding diathesis)
5. **Very concerning for inflicted injury** (given history unlikely to produce documented injuries or concerning injury with no history of trauma – i.e. 4 month old with femur fracture)

6. **Representative of substantial evidence of inflicted injury** (severe injury with no offered history in a child incapable of inflicting the injury on himself or herself, history inconsistent with identified injuries, serious injury with changing history or history inconsistent between caregivers, inappropriate delay in seeking care, multiple severe injuries of different ages without plausible explanation)

6. **Definite inflicted injury** (pattern bruises/burns, unexplained posterior rib fractures, characteristic retinal hemorrhages, reliable eye witness, suspicious injury and concurrently abused sibling, obvious injury with significant, unexplained delay in seeking care – i.e. serious burn, unresponsive child, apparent prolonged seizures)

7. **Impact Statement Template**

   .IMPACTSTATEMENTTEMPLATE

   @TD@

   *** County CPS
   Attn: ***
   ***
   ***, NY ***

   Regarding: @NAME@ (DOB @DOB@)
   Dear ***:

   As you know, @ID@ who was admitted to Upstate Golisano Children’s Hospital on @ADMITDT@ for ***. The history as reported by ***, is that ***. On exam in our Emergency Department, @FNAME@ was found to have ***.

   @FNAME@ was admitted to the hospital under my service. Due to concern for possible child abuse, a full non-accidental trauma work up has been initiated per our hospital protocol. The work-up has revealed the following:

   1. Routine laboratory studies {were/were not:19694} remarkable. The coagulation profile and platelet count {were/were not:19694} normal indicating that @FNAME@ {does/does not:19886} have a bleeding disorder that could cause abnormal bruising in the absence of trauma. ***

   2. Head CT was {gen negative/positive:315881} for head injury. ***

   3. Dilated eye exam was {gen negative/positive:315881} for intraretinal hemorrhages (bleeding with the eye tissues).
4. A skeletal survey (series of full body x-rays) was obtained and {Desc; did/not:14019} show additional injuries. This will be repeated in 2 weeks for routine follow-up to make sure there are no additional findings that are too recent to show up on the initial study.

5. Examination of the skin was {Desc; normal/abnormalWildcard:19619}.

There are several aspects of @FNAME@’s history, imaging and/or clinical findings that are concerning for non-accidental trauma. ***. @LIKELIHOODSCALE@.

Please let me know if anything in this letter requires further clarification.

Sincerely,

8. NAT Consult Template (*not currently in use)

.PEDIATRIC NON-ACCIDENTAL TRAUMA CONSULT NOTE

RE: @NAME@
DOB: @DOB@
MRN#: @MRN@
PCP: @PCP@
Date of Consult: @TD@

Consult Requested By: Dr. ***

Chief Complaint
@CC@

History of Present Illness

History obtained from: ***

@NAME@ is a @AGE@ @SEX@ who presents with ***

Additional history: ***

Developmental Milestones
Rolling: {yes/no/unk:311367}
Cruising: {yes/no/unk:311367}
Walking: {yes/no/unk:311367}
Parental concern for delays: {yes/no/unk:311367}
NAT Screen (history red flags)
Unwitnessed injury: {Blank single:19197::"YES", "no"}
No history/history inconsistent with injury: {Blank single:19197::"YES", "no"}
Changing history: {Blank single:19197::"YES", "no"}
Delay in seeking care: {Blank single:19197::"YES", "no"}
Prior ED visit: {Blank single:19197::"YES", "no", "unknown"}
Domestic violence in the home: {Blank single:19197::"YES", "no", "unknown"}
Premature infant (<37 weeks): {Blank single:19197::"YES", "no", "unknown"}
Low birth weight/IUGR: {Blank single:19197::"YES", "no", "unknown"}
Chronic medical conditions: {Blank single:19197::"YES", "no", "unknown"}

Past Medical History
@PMH@

Birth History: ***

Immunizations: {Blank single:19197::"up to date", "not up to date", "unknown"}

Past Surgical History
@PSH@

Home Medications
@HMEDS@

Allergies
@ALLERGY@

Family/Social History
@FAMHX@

History of DA, SA, DV, mental health disorders, or prior CPS involvement: {Blank single:19197::"Yes - ***", "no", "not asked"}
Cultural or social issues to be aware of: {Blank single:19197::"Yes - ***", "no", "not asked"}
Any major illness in the immediate family: {Blank single:19197::"Yes - ***", "no", "not asked"}
Anesthetic complications/allergies: {Blank single:19197::"Yes - ***", "no", "not asked"}
Bleeding disorders: {Blank single:19197::"Yes - ***", "no", "not asked"}
Any other young children that reside in the home: {Blank single:19197::"Yes - ***", "no", "not asked"}

Review Of Systems
@ROSBYAGE@

Physical Exam
@VS@
General appearance: ***
HEENT (note condition of lips, tongue, buccal mucosa, frenula, palate, and teeth): ***
Neck: ***
CVS: ***
Lungs: ***
Abdomen: ***
Musculoskeletal: ***
Neuro: ***
GU: ***
Skin (note auricle exam, scalp/hair): ***

### NAT Screen (physical exam red flags)
- Torn frenulum: {Blank single:19197::"YES", "no"}
- Evidence of FTT: {Blank single:19197::"YES", "no"}
- Infant with large head: {Blank single:19197::"YES", "no"}
- Patterned Scars: {Blank single:19197::"YES", "no"}
- ANY bruise in a non-ambulatory child: {Blank single:19197::"YES", "no"}
- Bruising in a non-exploratory location in a child less than 4 yrs old (torso, ears, neck): {Blank single:19197::"YES", "no"}

### Tests Ordered/Reviewed

**Labs:**
- @IPRESULTRCNT(24H)@
- LFTs elevated: {Blank single:19197::"YES", "no", "no results yet"}
  
  If LFTs are elevated above twice normal, CT of abdomen/pelvis should be obtained.

**Imaging:**
- @WETREAD@

### NAT Screen (radiographic red flags)
- Metaphyseal corner fractures: {Blank single:19197::"YES", "no", "skeletal survey pending"}
- Rib fractures (especially posterior) in infants: {Blank single:19197::"YES", "no", "skeletal survey pending"}
- ANY fracture in a non-ambulatory child: {Blank single:19197::"YES", "no"}
- Any undiagnosed healing fracture: {Blank single:19197::"YES", "no", "skeletal survey pending"}
- SDH and/or SAH in the absence of a skull fracture in a child < 1 year: {Blank single:19197::"YES", "no", "head imaging pending"}

### Assessment
- @NAME@ is a @AGE@ @SEX@ who presents with ***.
After reviewing @FNAME@'s history, physical exam, laboratory tests and imaging studies, there {is/is not:320031} concern for possible non-accidental trauma.

**Plan**
Admit to: {Blank single:19197::"Pediatric Surgery", "***"}

Consults: {NAT consults:22895}

Imaging: {NAT Imaging:22896}

Labs: CBC with platelets, PT/PTT/INR, amylase, lipase, ALT/AST, urine dip for blood and stool for guaiac per protocol - if not already done.

Other:
***